2024

Roll No. .....

Total No. of Questions : 9] [Total No. of Printed Pages : 4

(2034)

UG (CBCS) IIIrd Year Annual Examination

2996

B.Sc. PHYSICS

(Elements of Modern Physics)

(DSE-1A)

Paper : PHYS 301 TH

Time : 3 Hours] **[Maximum Marks : 50**

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Note :– Attempt *five* questions in all, selecting *one* question each from Sections–B, C, D and E. Question No. 1 (Section–A) is compulsory.

Section–A

(Compulsory Question)

1. (a) Give difference between Photoelectric effect and compton effect.

   (b) What is inverse β-decay ?

(c) Define two main units to measure intensity of radioactivity.

(d) Calculate rest mass energy of electron in MeV.

(e) What is meant by electron capture ?

(f) What is moderator ?

(g) Write short note on 'Slow and Fast neutrons'. 2×7=14

Section–B

2. (a) What is phase velocity and group velocity of wave packet ? Show that group velocity is equal to velocity of the moving particle.

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(b) Derive relation between phase velocity and group velocity. 5,4

3. (a) Describe Franck-Hertz experiment. What does it demonstrate ?

(b) Discuss correction in Bohr's theory for finite mass of nucleus. 5,4

Section–C

4. (a) State and prove Heisenberg's uncertainty principle.

   (b) Using uncertainty principle find binding energy of electron in H-atom. 5,4

5. What is the need for a differential wave equation ? Obtain time dependent and time independent forms of Schrödinger's wave equation. 9

Section–D

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6. What is tunnel effect ? Derive expression for transmission coefficient through rectangular barrier for $E < V_0$, where E is energy of incident particle and V_0 is height of the barrier having width 'a'. 9

7. (a) What is semi-empirical mass formula ? Explain significance of various terms.

   (b) What are merits and demerits of liquid drop model ? 6,3

Section–E

8. (a) What is β-decay ? Describe neutrino hypothesis of β-decay. Give evidence for the existence of neutrino.

(b) Find the half-life time of a radioactive material, if its activity drops to $\frac{1}{64}$ th of its initial value in 30 years. 6,3

9. (a) Discuss in detail the construction and working of nuclear reactor.

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(b) Compare the energy released in a nuclear fission and nucl fusion. 6,3